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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|--|-------------|----------------------|---------------------|------------------|
| 10/667,730 | 09/22/2003 | Georg Schmidt | MUH-12777 | 9685 |
| 24131 | 7590 | 02/23/2005 | EXAMINER | |
| LERNER AND GREENBERG, PA P O BOX 2480 HOLLYWOOD, FL 33022-2480 | | | HUYNH, ANDY | |
| | | | ART UNIT | PAPER NUMBER |
| | | | 2818 | |

DATE MAILED: 02/23/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

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|------------------------------|-------------------------------|--------------------------------|--|
| Office Action Summary | Application No. 10/667,730 | Applicant(s) SCHMIDT ET AL. | |
| | Examiner Andy Huynh | Art Unit 2818 | |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 28 December 2004.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-17 is/are pending in the application.
- 4a) Of the above claim(s) 18-20 is/are withdrawn from consideration.
- 5) ☐ Claim(s) 12, 14 and 15 is/are allowed.
- 6) ☒ Claim(s) 1-11, 16 and 17 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 22 September 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

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DETAILED ACTION

In the Amendment dated December 28, 2004, claim **12** is amended is acknowledged. Accordingly, claims **1-17** remain pending in this application.

Response to Arguments

Applicant's arguments, see the Response to Office Action and Amendment, filed 12/28/04, with respect to the rejection(s) of claim(s) **1-11 and 16-17** have been considered but are moot in view of the new ground(s) of rejection.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims **1-7, 16 and 17** are rejected under 35 U.S.C. 103(a) as being unpatentable over Hehn et al. (WO 00/59051, dated 10/05/2000 hereinafter referred to as Hehn) in view of Kamiguchi et al. (USP: 5,5,962,905 hereinafter referred to as "Kamiguchi").

Regarding claims **1-7**, Hehn discloses in Fig. 1 a magnetoresistive semiconductor element/a microelectronic device with tunnel junctions, comprises:

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a first contact (1; 3) made of a semi-metallic material;
a second contact (3; 5) made from magnetic or semi-metallic material;
a layer of a nonmagnetic semiconductor/a layer of insulating material (2; 4) configured between said first contact and said second contact; and
a tunnel barrier (2; 4) configured between said first contact and said layer of said nonmagnetic semiconductor (English Abstract).

Hehn fails to teach a first and a second contacts are made of a semi-magnetic material. Kamiguchi teaches that a semimagnetic semiconductor may be used as a material for the semiconductor layer. In the semimagnetic semiconductor, when the conduction electrons are spin-polarized, a large energy band splitting is produced because of magnetic atoms added to a semiconductor. Consequently, a large output change can be provided in the case where the semimagnetic semiconductor is used, compared with the case where the general semiconductor is used as set forth in col. 4, lines 45-55. And the ferromagnetic layer and the semiconductor layer form ohmic contact in order to enhance the injection efficiency of spin-polarized carriers from the ferromagnetic layer into the semiconductor layer as set forth in col. 4, lines 32-36. It would have been obvious to one of ordinary skill in the art at the time of the invention was made to utilize the teaching of a semimagnetic semiconductor used as a material for the semiconductor layer and formed ohmic contact, as taught by Kamiguchi in order to enhance the injection efficiency of spin-polarized carriers from the ferromagnetic layer into the semiconductor layer.

Regarding claims 16-17, Hehn and Kamiguchi disclose the all claimed limitations except for a magnetic sensor/a read head for reading information stored in magnetic storage media comprises a plurality of electric feed and discharge lines, each one said plurality of electric feed

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and discharge lines connected to a respective one of said first contact and said second contact; and a measuring device connected to said plurality of electric feed and discharge lines for measuring a change in electrical resistance. It would have been obvious to one of ordinary skill in the art at the time of the invention was made to connect each of a plurality of electric feed and discharge lines to a respective one of the first contact and the second contact; and a measuring device connected to the plurality of electric feed and discharge lines for measuring a change in electrical resistance since it has been held that the such set up of a plurality of electric feed and discharge lines and a measuring device, where needed, involves only routine skill in the art.

Claims 8-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hehn et al. (WO 00/59051, dated 10/05/2000 hereinafter referred to as Hehn) in view of Kamiguchi et al. (USP: 5,5,962,905 hereinafter referred to as "Kamiguchi"), and further in view of Fiederling, R. et al.: "Injection and Detection of a Spin-Polarized Current in a Light-Emitting Diode", Nature, www.nature.com, Vol. 402, December 16, 1999, pp. 787-790 hereinafter referred to as "Fiederling", Applicant submitted prior art (ASPA).

Hehn and Kamiguchi disclose the all claimed limitations except for the magnetoresistive semiconductor element/the microelectronic device with tunnel junctions wherein said semi-magnetic material is a II-IV semiconductor; and wherein said II-VI semiconductor is $\text{Be}_x\text{Mn}_y\text{Zn}_{1-x-y}\text{Se}$ with $0 < x < 1$, $0 < y < 1$ and $0.0001 < y < 0.2$. Fiederling teaches that the semi-magnetic material is a II-IV semiconductor, and the II-VI semiconductor is $\text{Be}_x\text{Mn}_y\text{Zn}_{1-x-y}\text{Se}$ with $0 < x < 1$, $0 < y < 1$ and $0.0001 < y < 0.2$ (p. 789). It would have been obvious to one of ordinary skill in the art at the

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time of the invention was made to utilize the semi-magnetic material is a II-IV semiconductor, and the II-VI semiconductor is $\text{Be}_x\text{Mn}_y\text{Zn}_{1-x-y}\text{Se}$ with $0 < x < 1$, $0 < y < 1$ and $0.0001 < y < 0.2$, as taught by Fiederling, to incorporate into Hehn' structure to arrive the claimed limitation because the II-VI semiconductor $\text{Be}_x\text{Mn}_y\text{Zn}_{1-x-y}\text{Se}$ has particular properties that make it ideally suitable as a spin-aligner for injecting electrons (p. 787).

Claims 10-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hehn et al. (WO 00/59051, dated 10/05/2000 hereinafter referred to as Hehn) in view of Kamiguchi et al. (USP: 5,596,905 hereinafter referred to as "Kamiguchi"), and further in view of Gallagher et al. (USP: 5,640,343 hereinafter referred to as "Gallagher").

Hehn and Kamiguchi disclose the all claimed limitations except for the magnetoresistive semiconductor element further comprises a Schottky diode/a pn diode for providing a current path for decoupling; and for providing a current path for decoupling. Gallagher teaches the diode in the memory cell functions as unidirectional current valve. Thus any such diode-like device, as Schottky barrier diodes, can be used in place of the preferred silicon junction diode. The voltage swing for the word lines and bits lines are reduced for Schottky diodes with a lower diode voltage than silicon junction diodes. Also, the charge storage effects are smaller for Schottky diodes, which decrease the time to complete a read operation (col. 10, line 58-col. 11, line 36). Gallagher also teaches in Figs. 10A-10C that a memory cell uses a diode (37) formed on a semiconductor substrate (100). For efficiency, a diode (37) compatible with silicon VLSI processing is used as the memory cell diode. It would have been obvious to one of ordinary skill

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in the art at the time of the invention was made to incorporate a Schottky diode/a pn diode used in the memory cell, as taught by Gallagher into Hehn's structure to form the claimed limitations for efficiency and reducing the voltage swing for the word lines and bits lines.

Allowable Subject Matter

Claims 12-15 are allowed.

Conclusion

A shortened statutory period for response to this action is set to expire 3 (three) months and 0 (zero) day from the day of this letter. Failure to respond within the period for response will cause the application to become abandoned (see M.P.E.P 710.02(b)).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Andy Huynh, (571) 272-1781. The examiner can normally be reached on Monday-Friday from 8:30 AM to 5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Nelms can be reached on (571) 272-1787. The Fax number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the -status of this application or proceeding should be directed to the receptionist whose phone number is (703) 308-0956.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished

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applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Ah

02/21/05



Andy Huynh

Patent Examiner